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IS 3513-2 (1989): Resin treated compressed wood laminates (compregs) - Specification, Part 2: For chemical purposes [CED 20: Wood and other Lignocellulosic products]



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“Knowledge is such a treasure which cannot be stolen”

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IS 3513 (Part 2) : 1989

REAFFIRMED

2008

Indian Standard

**SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD
LAMINATES (COMPREGS)**

PART 2 FOR CHEMICAL PURPOSES

(First Revision)

UDC 674·812·2 : 678·632·66·0

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BUREAU OF INDIAN STANDARDS
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October 1989

Price Group 3

AMENDMENT NO. 1 JUNE 2005
TO
IS 3513 (PART 2) : 1989 SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)
PART 2 FOR CHEMICAL PURPOSES
(First Revision)

(*Pages 2 and 3, clauses 7.1 and 7.1.1*) — Substitute the following for the existing:

7.1 Boards

The dimensions of resin treated compressed wood laminate boards shall be as follows:

Length in mm : 2 400, 2 100, 1 800, 1 500, 1 200, 900 and 600

Width in mm : 1 200, 900, 600, 300 and 150

NOTE — Any other dimension as agreed to between the manufacturer and the purchaser may also be used.'

(*Page 3, clause 7.1.2*) — Renumber the clause and substitute the following for the existing:

7.1.1 Thickness

Unless otherwise specified the thickness of resin treated compressed wood laminate boards shall be 3 mm, 4 mm, 5 mm, 6 mm, 8 mm, 12 mm, 16 mm, 20 mm, 25 mm, 32 mm, 40 mm, 50 mm, 60 mm and 70 mm.'

(*Page 3, clause 7.1.3*) — Renumber the clause and substitute the following for the existing:

7.1.2 Tolerances

The tolerance on the nominal sizes of finished boards shall be as follows:

Amend No. 1 to IS 3513 (Part 2) : 1989

<i>Dimensions</i>	<i>Tolerance</i>
Length	+6 mm -0 mm
Width	+3 mm -0 mm
Thickness:	
i) Less than 6 mm	±10 percent
ii) 6 mm and above	±5 percent
Edge straightness	2 mm per 1 000 mm or 0.2 percent
Squareness	2 mm per 1 000 mm or 0.2 percent

(CED 20)

AMENDMENT NO. 2 DECEMBER 2008
TO
IS 3513 (PART 2) : 1989 SPECIFICATION FOR RESIN
TREATED COMPRESSED WOOD LAMINATES
(COMPREGS)

PART 2 FOR CHEMICAL PURPOSES

(First Revision)

(Page 2, clause 5.2) — Substitute the following for the existing:

‘The synthetic resins used for impregnation and bonding of veneers shall be of phenol or cresol formaldehyde type and the resultant resin adhesive shall conform to the requirements specified in IS 848 : 2006.’

(Page 6, Annex A) — Substitute the following for the existing as appropriate and delete ‘IS 303 : 1975’ and its corresponding title from the list:

‘IS 848 : 2006 Synthetic resin adhesives for plywood (phenolic and aminoplastic) — Specification *(second revision)*’

FOREWORD

This Indian Standard (Part 2) (First Revision) was adopted by the Bureau of Indian Standards on 22 April 1989, after the draft finalized by the Wood Products Sectional Committee had been approved by the Civil Engineering Division Council.

Resin treated compressed wood laminates also known as compregs are laminates made from thin wood veneers and thermosetting phenol or cresol formaldehyde resins. They combine within themselves enhanced mechanical properties with the stabilizing and moistureproof qualities of thermosetting resins; besides, they have good machining properties and resistance to corrosive environments and termite attack. Compregs are manufactured in different shapes, such as, sheets, rods and moulded shapes.

In the field of chemical industry, compregs are used for exhaust hoods of chemical baths, impellers and shafts for the agitation of acids and chemicals, filter plates and frames for press plants for the recovery of chemicals, rumbling barrels, submerged bearings, filter trays, effluent grids, chemical resistant linings, etc. In addition, the compregs have several other applications, such as, screen hangers and connecting rods for coal cleaning plants.

The grading of compregs is based upon the extent and nature of impregnation of the resin-forming chemicals, and also upon the compression and density as a result of pressure applied for curing and bonding, whereas the different types in each of the grades indicate the arrangement of the veneer and therefore, relative orientation of wood fibre in various directions.

The dimensions of compreg boards and rounds have not been covered exhaustively as these vary widely depending upon the end-use. However, for general guidance, certain stock dimensions have been indicated.

This standard was first published in 1966. In the present revision, the requirements of various properties of compreg have been revised keeping in view the latest developments in the industry and the feedback from the users.

This standard is now published in four parts, namely:

Part 1 For electrical purposes

Part 2 For chemical purposes

Part 3 For general purposes

Part 4 Sampling and tests

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

**SPECIFICATION FOR
RESIN TREATED COMPRESSED WOOD
LAMINATES (COMPREGS)**

PART 2 FOR CHEMICAL PURPOSES

(First Revision)

1 SCOPE

1.1 This standard (Part 2) covers requirements of resin treated compressed wood laminates (compregs) for use in chemical industry.

1.2 This standard does not cover the requirements for solid compressed wood.

2 REFERENCES

2.1 The Indian Standards listed in Annex A are necessary adjuncts to this standard.

3 TERMINOLOGY

3.1 For the purpose of this standard, definitions given in IS 707 : 1976 and the following shall apply.

3.2 Compreg

A wood-based laminated material made from thin wood veneers either impregnated under vacuum and/or pressure with synthetic resins or coated with synthetic resin or interlaid with synthetic impregnated paper and further bonded and densified under heat and pressure. The synthetic resins are usually of phenol and cresol formaldehyde type.

3.3 High Density Compreg

Compreg with specific gravity between 1.25 and 1.35.

4 TYPES

4.1 Compreg for chemical purposes shall be fully impregnated and high density materials suitable for chemical resistant structures and components. It shall be of two types, namely, Type V and Type VI, depending on grain orientation of individual veneers in a board as follows:

a) *Type V* — In this type, the grain orientation of the constituent veneers shall be in the direction of the axis of load.

This type is suitable for parts subject to tensile stress and is thus suited for fabrication of sticks, flats, rods, turned parts and threading.

b) *Type VI* — In this type, the grain orientation of the constituent veneers shall be more or less equal in each axis, at right angles to each other.

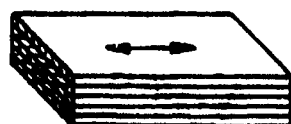
This type is of high compressive strength in the direction of its thickness and is also rigid. It is suited for sheet and block forms.

4.1.1 Typical sketches illustrating the direction of grains of the veneers in the assembly for the two types are indicated in Fig. 1.

5 MATERIALS

5.1 Timber

Any non resinous species of timber may be used for the manufacture of veneers required for making compreg.



TYPE V



TYPE VI

FIG. 1 TYPES OF COMPREG SHOWING ARRANGEMENT OF LAMINAE

5.1.1 The veneers shall be either rotary cut or sliced and maximum variation in grains shall not exceed 1 in 10. It shall be smooth, free from knots, splits, dry rot or any other type of rot and resin pockets. The veneers shall be of uniform thickness with tolerance of ± 5 percent, and dried to a suitable moisture content not exceeding 8 percent.

5.1.2 In selecting the species for the manufacture of compreg it is recommended that, as far as possible, a single species of timber be used in a pack and where combination of different species is unavoidable, care shall be taken to prevent incompatibility of the various species.

5.2 Synthetic Resins

The synthetic resins used for impregnation and bonding of veneers shall be of phenol or cresol formaldehyde type and shall conform to IS 848: 1974.

5.3 Varnishes

Varnishes used for treating compreg boards and the machined components of compreg shall conform to IS 524 : 1983 and IS 525 : 1968.

6 MANUFACTURE

6.1 The constituent veneers of compreg for chemical purpose shall be impregnated with synthetic resins and compressed as in 6.1 of IS 3513 (Part 1) : 1989 except that in addition to phenol or cresol formaldehyde type of resin, alternative synthetic resins could be used provided these impart all the requirements of properties. The resin content of the veneers shall be a minimum of 40 percent on oven-dry basis.

6.2 Compreg for chemical purposes shall be manufactured in such a way as the following conditions are satisfied:

<i>Synthetic Resin</i>	<i>Impregnation Method</i>	<i>Percent Resin on Oven-Dry Basis</i>	<i>Curing Temperature</i>	<i>Curing and Bonding Pressure</i>
Alkali catalysed phenol or cresol formaldehyde resin or phenol formaldehyde film	Vacuum impregnation with or without subsequent pressure	40, Min	135 to 150°C	7 to 15 MPa

6.3 The thickness of veneers for the manufacture of compreg shall be between 0.7 and 2 mm. The thickness of individual veneers shall not vary beyond ± 5 percent of the average thickness.

6.3.1 The veneers required to be edge-jointed shall be so done on a tapeless splicer and no staples or tapes shall be used. The adhesive used for splicing should be compatible with the phenol or cresol formaldehyde resins to be later used for impregnation and bonding.

6.3.2 Where in an assembly different species are used, care shall be taken to see that they are not incompatible and that they are balanced around the central axis (see also 5.1.2).

6.3.3 In one pack, usually veneers of the same thickness shall be used except where adjustment is to be made for density; but in case different thicknesses are used, these shall be balanced around the central axis.

6.3.4 The veneers of one pack shall be cut by the same method, that is, either rotary cut or sliced. If cut by different methods, these should be so assembled that these balance around the central axis.

6.4 The compreg boards, after discharge from the press, shall be kept for a minimum period of one week to normalize internal stresses and then they shall be cut to the required sizes and finished.

6.5 The resins used shall have no fillers or extenders. A suitable modifying agent may be used to impart the required special properties to the board.

6.5.1 When the thickness of the board required exceeds the thickness the press can accommodate, it may be obtained by glueing two or more boards using similar and compatible resin used for impregnation and bonding with the prior approval of the purchaser.

6.6 A purchaser ordering for machined components shall provide the necessary drawing giving details as to the dimensions of the components and tolerances, and the component shall be supplied in accordance with the drawings.

6.7 The edges of all the boards and the surfaces of all components shall be given a protective coat with suitable insulating varnish conforming to IS 524 : 1983 and IS 525 : 1968.

7 DIMENSIONS AND TOLERANCES

7.1 Boards

The dimensions of platten finished compreg boards shall be quoted in the following order:

The first dimension shall represent the length, that is, the dimension parallel to the grain of faces; the second, the width, that is, the dimension at right angle to the grains of faces and the third, the thickness.

7.1.1 Size

The stock sizes for compreg boards shall generally be the following:

mm	mm
2 100	× 1 200
2 100	× 900
1 800	× 1 200
1 800	× 900
1 500	× 1 200
1 500	× 900
1 500	× 600
1 500	× 300
1 500	× 150
1 200	× 1 200
1 200	× 600
1 200	× 300
1 200	× 150
900	× 900
900	× 600
900	× 300
900	× 150
600	× 600
600	× 300
600	× 150

7.1.2 Thickness

The preferred thickness of compreg boards shall be 3, 4, 5, 6, 8, 10, 12, 16, 20, 25, 32, 40, 50, 60 and 70 mm.

7.1.3 Tolerances

The following tolerances on the nominal size of finished compreg boards shall be permissible:

Dimension	Tolerance
a) Length	: + 6 mm : - 0 mm
b) Width	: + 3 mm : - 0 mm
c) Thickness	less than 6mm : ± 10 percent 6 mm and above : ± 5 percent

7.2 Rods

The sizes for round rods of compreg shall generally be the following:

Length	Diameter
mm	mm
1 500	8 to 50
1 200	3 to 50
900	50 to 80
600	6 to 40

7.2.1 Compreg rods of longer lengths and intermediate or greater diameters may be manufactured according to the requirements of the purchaser.

7.2.2 The tolerance on diameters of compreg rods shall be as follows:

Rods up to and including 40 mm dia : 0 mm
- 0.20 mm

Rods 50 mm dia and above : 0 mm
- 0.25 mm

7.3 The purchaser ordering compreg cut to special size and shapes, such as, round discs, rings and gear blanks to any required taper or finished parts, shall provide the necessary drawings specifying material, dimensions and tolerances, and the supplies shall be in accordance with the drawing of the purchaser.

7.3.1 Tolerance on finished components or blanks shall be according to the drawings of the purchaser.

8 PHYSICAL AND MECHANICAL PROPERTIES

8.1 The physical properties of compreg for chemical purposes shall conform to Table 1 when tested by the methods given therein.

8.2 The mechanical properties of two types, namely, Type V and VI, shall conform to Table 2.

8.3 The mechanical properties of chemical grade compreg when subjected to soaking for a period of 12 weeks in chemical solution of strength indicated in Table 3 and tested shall be such that the bending strength, compressive strength and impact strength shall not be reduced from the original value by more than the percentages indicated in Table 3.

8.3.1 Test Specimen

Three sets of test specimens shall be prepared for impact test, bending test and compression test as

Table 1 Physical Properties, Both Types
(Clause 8.1)

Sl No.	Test	Requirement	Method of Test
(1)	(2)	(3)	(4)
1	Specific gravity	1.25, <i>Min</i>	IS 1708 (Part 2) : 1986
2	Moisture content and volatile matter	4 percent, <i>Max</i>	IS 1708 (Part 1) : 1986
3	Water absorption at $27 \pm 2^\circ\text{C}$	1.2 percent, <i>Max</i>	IS 3513 (Part 4) : 1966
4	Sporadic working temperature	90°C, <i>Max</i>	IS 3513 (Part 4) : 1966

Table 2 Mechanical Requirements
(Clause 8.2)

Sl No.	Test	Requirements		Method of Test
		Type V	Type VI	
(1)	(2)	(3)	(4)	(5)
1	Minimum tensile strength (MPa)	200	100	IS 1734 (Part 9) : 1983
2	Minimum static bending strength (MPa)	200	90	IS 1998 : 1962
3	Minimum compressive strength (MPa) (Specimen 20 mm × 20 mm × 20 mm)			
	a) Parallel to laminae	100	120	IS 1708 (Parts 8 and 9) : 1986
	b) Perpendicular to laminae	70	150	
4	Minimum shear strength (MPa)			
	a) Parallel to grain and laminae (edgewise)	14	20	IS 1708 (Part 11) : 1986
	b) Perpendicular to grain and perpendicular to laminae (flatwise)	35	30	
5	Minimum hardness (Rockwell H scale)	70	80	IS 1586 : 1988
6	Minimum impact strength (Izod) (un-notched sample) kg m/cm ²			
	a) Perpendicular to laminae	—	0.20	IS 1998 : 1962
	b) Parallel to laminae	—	0.50	

Table 3 Properties of Chemical Grade Compreg After Chemical Treatment
(Clause 8.3)

Strength Relating	Size of Specimen mm	Chemicals	Minimum Strength Value as Percentage of Original
(1)	(2)	(3)	(4)
Impact	12 × 12 × 64 (unnotched)	{ 20% Sulphuric acid 20% Nitric acid 20% Hydrochloric acid	80 80 75
Bending	Length : 24-30 times the thickness Width : 15 ± 0.5 mm Thickness : Thickness of the sheet (up to 10 mm) from which the test specimen is cut. Reduce in the thickness to 10 mm case of higher thickness	{ 20% Sulphuric acid 20% Nitric acid 20% Hydrochloric acid	70 40 45
Compression	20 × 20 × 20	20% Sulphuric acid 20% Nitric acid 20% Hydrochloric acid	80 70 70

given in Table 3. Each set consists of 12 specimens, 3 to be treated as blanks for control values and the rest 9 divided into 3 groups each of 3 specimens. Thus there are 4 groups of specimens in each set; one for impact test, one for bending test and one for compression test.

8.3.2 Procedure

The blank for each test shall be tested for control values for the following:

- a) Impact strength,
- b) Bending strength, and
- c) Compression strength.

Other three groups shall be soaked for a period of 12 weeks at room temperature in chemical solutions indicated in Table 3 and tested for impact strength, bending strength and compression strength as prescribed in IS 3513 (Part 4) : 1966. The strength values obtained shall be not less than the percentage of the original value as indicated in Table 3.

9 WORKMANSHIP AND FINISH

9.1 When supplied in board form, the face and back of board shall be free from checks, splits, blisters, discolouration, overlaps, gaps and open joints, and the boards shall be free from warp.

9.2 Compreg boards may be either platten finished or machine finished.

9.2.1 The machine finished boards shall be given a protective coat of varnish as required by the purchaser. Usually the edges of the boards shall be given a coat of protective varnish.

9.2.2 The machined components in case of compreg of chemical grades shall be given a coat of high viscosity varnish.

10 SAMPLING

10.1 Sampling shall be done as specified in IS 3513 (Part 4) : 1966

11 TESTING

11.1 Test specimens cut from each of the boards selected shall be tested by the appropriate methods specified in appropriate tables.

11.2 Tests on Finished Machined Components

The manufacturer shall furnish a certificate to the purchaser that the finished components or part is made from compreg conforming to this standard for the particular type. If required by the purchaser, sample test pieces shall be tested

from the same board, and test results thereon should be supplied.

11.3 Retests

If any piece fails to fulfil the test requirements specified under 11.1, a further set of duplicate samples on the basis prescribed under 11.1 shall be selected by the purchaser from the same batch for testing in the same manner. Test pieces prepared from these two further samples shall comply with the requirements, otherwise the batch shall be rejected.

12 MARKING

12.1 If compreg is supplied in board form, each board, and if supplied in component form, each component, or if components are small, each package of components shall be legibly and indelibly marked or stamped with the following particulars along with such other marks as the purchaser may stipulate at the time of placing a contract:

- a) Type and finish;
- b) Manufacturer's name, initials or recognized trade-mark;
- c) Year of manufacture; and
- d) Batch number.

13 PACKING AND DELIVERY

13.1 The boards or components shall be delivered in a clean and dry condition and shall be suitably packed.

14 INFORMATION TO BE SUPPLIED BY THE PURCHASER

14.1 The purchaser shall supply the following information to the supplier with his order:

- a) Number of boards or number of components;
- b) Type of material;
- c) Size and thickness;
- d) If components are required, full detailed drawings along with the tolerances and dimensions;
- e) Whether supply is to be platten finished or machine finished;
- f) Whether supply is to be oil finished or varnish finished; and
- g) Any other special requirement.

ANNEX A

(Clause 2.1)

LIST OF INDIAN STANDARDS REFERRED IN THE STANDARD

<i>IS No.</i>	<i>Title</i>	<i>IS No.</i>	<i>Title</i>
IS 303 : 1975	Specification for plywood for general purposes (<i>second revision</i>)	(Part 2) : 1986	Determination of specific gravity
IS 524 : 1983	Specification for varnish, finishing, exterior, synthetic, air drying (<i>second revision</i>)	(Part 8) : 1986	Determination of compressive strength parallel to grain
IS 525 : 1968	Specification for varnish, finishing, exterior and general purposes (<i>first revision</i>)	(Part 9) : 1986	Determination of compressive strength perpendicular to grain
IS 707 : 1976	Glossary of terms applicable to timber technology and utilization (<i>second revision</i>)	(Part 11) : 1986	Determination of shear strength parallel to grain
IS 848 : 1974	Specification for synthetic resin adhesives for plywood (phenolic and aminoplastic)	IS 1734	Methods of test for plywood (<i>second revision</i>)
IS 1586 : 1988	Method for Rockwell hardness test for metallic material (Scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)	(Part 9) : 1983	Determination of tensile strength
IS 1708 :	Methods of testing of small clear specimens of timber (<i>second revision</i>)	IS 1998 : 1962	Methods of test for thermo-setting synthetic resin bonded laminated sheets
(Part 1) : 1986	Determination of moisture content	IS 3513 (Part 1) : 1989	Specification for resin treated compressed wood laminates (compregs) : Part 1 For electrical purposes
		IS 3513 (Part 4) : 1966	Specification for high and medium density wood based laminates (compreg) : Part 4 Sampling and tests (<i>under revision</i>)

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